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AUTHOR Hearne, J. Dixon; And Others
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ABSTRACT

The study examined computer aptitude among 56 learning disabled (LD) and 56 non LD junior high students. Students were administered the Computer Aptitude, Literacy, and Interest Profile (CALIP). Results revealed no significant difference in computer aptitude among groups or between male and female non LD students. A significant difference was found between the computer aptitude of male and female LD students. Findings offered no support for proposed differences in reasoning ability or mental processes among LD students. (CL)

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Computer Aptitude: Learning Disabled Versus Non-Learning Disabled Junior High School Students

J. Dixon Hearne and Mary Poplin
Claremont Graduate School
Claremont, California

Carole Schoneman
Chino Unified School District
Chino, California

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Abstract

Despite its growing utility as a creative and self-expressive medium, the computer is rarely accessible for such purposes in the classroom. The professional literature is replete with evidence that computer utilization among the learning disabled (LD) had been primarily a computer-assisted instruction (CAI) approach. This narrow view of the learner as receptor suggests, among other things, that because of their exceptionalities, learning disabled students possess relatively fewer strengths than their non-learning disabled (NLD) peers and less aptitude for such complex and creative tasks as programming. The purpose of the present study was to examine differences in computer aptitude among 56 LD and 56 NLD junior high students. Subjects in each group were administered the Computer Aptitude Literacy, and Interest Profile (CALIP) (Poplin, M. S., Drew, D. E., & Gable, R. S., 1984) and their composite scores were compared. Results indicated no significant difference in scores earned by LD and NLD subjects in this sample, and intra-group score comparisons suggested that no relationship existed between gender and computer aptitude.

The field of learning disabilities, with a focus on exceptionalities, has contributed uniquely to shifting paradigms in education. As educational axioms are being stripped away by a growing body of information about intelligence and brain functions, our views about the learning process and the learner continue to change. Intelligence can no longer be confined to such categorical representations as IQ, according to Howard Gardner (1982; 1983; 1985), whose theory of multiple intelligence calls for a re-examination of our present

educational methodology and aims. Advocates for the kind of reform implicit in Gardner's theory stand united in the belief that strengths and talents are the best channels through which the learner may be reached. Because the schools are deficit-driven, however, as Poplin (1984) suggests, individual talents receive only minor attention in the classroom and even less in school-wide planning.

Computer aptitude represents only one of many aspects of human potential commonly overlooked by the schools. While the growing importance of microcomputers in the schools is unquestionable, an entire publication industry has emerged over the past twenty years to deal with controversy over how they can best be used in the education of children who are literally growing up in an information age.

A recent review of the professional literature (Kolich, 1985), revealed that microcomputer application in the schools has been largely a computer-assisted instruction (CAI) enterprise. Patterned after a tradition of drill-and-practice adn tutorial pedagogy, CAI courseware has remained basically a form-to-function approach which has already failed large numbers of the school population, particularly among the learning disabled (LD).

While the computer has been generally viewed as an interactive device (Kolich, 1985), the degrees of interaction range from simple stimulus-response activities, typically reductionistic and learner-passive, to creative and self-expressive activities such as Papert's (1980) Logo programming, where multiple skills and knowledge are integrated. According to Papert (1980), CAI approaches generally reflect a narrow view of the user as receiver, give little or no attention to user potential or the natural knowledge of the child,

and neglect other areas of intelligence. Similar arguments in this general disregard for strengths and talents have sprung up in recent research (Gardner, 1984; 1985; Poplin, 1983; 1984; Turkle, 1985), and the entire focus of the cognitive strategies movement of the 1980's has been toward the more holistic concern for how individuals learn (Meichenbaum, 1980; Reid & Hresko, 1981; Poplin, 1983; 1984; Torgeson, 1979).

Because CAI approaches are product-oriented, focusing on what the child learns rather than how the child learns, they are often taken beyond their point of effectiveness in dealing directly with specific learning problems. Research conducted by Kerchner and Kistinger (1984) suggests that a shift from product to process-oriented instruction yields an enhanced picture of learner potential. By combining the process approach to written with microcomputer capabilities, they discovered improvement in both written expression and the subsequent transfer to paper-and-pencil tasks among one group of learning disabled students. Distinguishable from the CAI approach by the absence of imperatives and penalties, the process approach engages present skills, knowledge and strengths and encourages creativity.

Despite their wide range of utility, computers have been used more as teachers than as tools (Papert, 1980; Poplin, Drew & Gable, 1984; Turkle, 1985; Zemke, 1983). When viewed as the expressive medium described by Turkle (1985), the computer becomes an outlet for the natural knowledge and creativity the Paper (1980) suggests might otherwise remain hidden in a mire of competing classroom concerns. Because of the school's preoccupation with the identification of

deficits rather than strengths, however, such opportunities are not generally awarded the learning disabled student, typically a passive receptor of information that has been watered down and stretched out (Poplin, 1984).

Only recently, with the development of the Computer Aptitude, Literacy, and Interest Profile has research begun to focus on individual strengths and talents as predictors of success at computer-related tasks. Variables within the construct of computer aptitude have been identified at various times as (a) cognitive ability (Hearne & Lasley, 1985; Konvalina, Stephens, & Wileman, 1983; Poplin, & Gable, 1984; Turkle, 1985), (b) cognitive styles (Konvalina, Stephens, & Wileman, 1983; Poplin & Gable, 1984; Turkle, 1985), (c) societal influence on male-female work roles (Poplin, Drew, & Gable, 1984; Turkle, 1985), and (d) education (Konvalina, Stephens, and Wileman, 1983; Poplin, Drew, & Gable, 1984).

Because the CALIP was designed to minimize the need for complex languages skills, it can be used approximately in the investigation of computer aptitude among learning disabled populations. In the absence of any existing evidence to the contrary, the purpose of this study was to test the hypothesis that two groups of junior-high school students, one learning disabled (N = 56) and the other non-learning disabled (N = 56), possess equal or similar computer aptitude, as measured by the CALIP. Further objectives were (a) to determine the relationship between sex and computer aptitude among the learning disabled students in this sample and (b) to determine the relationship between sex and computer aptitude among non-learning disabled subjects in this study.

Method

Two samples were drawn for this study. The first sample consisted of 56 randomly selected junior high school students (28 males and 28 females), representing a metropolitan, predominantly middle-class school district located in the Southern California area. The second sample, drawn from the same school district, consist of 56 randomly chosen junior high school students (28 males and 28 females) who had been classified as "learning disabled". Subjects in both samples ranged in age form 12 to 14. Because of the extreme socioeconomic hemogeneity of the sample school district, demographic differences (social class, race, parents' educational backgrounds) between the two groups were minimal.

Each subject was administered the CALIP, from which an overall level of computer aptitude and relevant demographic data were obtained. Scores earned on four of the CALIP's subtests (Estimation, Graphic Patterns, Logical Structures, and Series) are converted to standard scores which combine to yield a Computer Aptitude Quotient (CAQ). In order to adapt the CAQ to contingency table analyses, a median cut-point was used to dichotomize the measure.

The CALIP's reliability was determined by internal consistency and stability over time. The Spearman-Brown split-half procedure and the coefficient alpha, developed by Cronbach (1951; Popham, 1981) were used to establish the test's internal consistency reliability. In all subtests, the criterion of .80 was met or exceeded. Stability was established through test-retest procedures, revealing a small error determined by the standard error of measurement.

Validity for the CAQ was determined by the degree of conformity of subjects to criteria established by Gronlund (1971:90). In each

of seven separate validity studies, statistically significant results were obtained. Interested readers are urged to consult Chapter 2 of the CALIP manual which reports reliability and validity data (Poplin, et al, 1984).

Results

The results of the study are presented as they are related to the three null hypotheses that were tested.

Ho_1: There is no relationship between computer aptitude and learning disabled and non-learning -disabled subjects.

Table 1 shows that within learning disabled and non-learning-disabled groups, there was no significant difference in computer aptitude, as measured by the CALIP ($X^2 = 2.32$; df = 1). Only minor variations were found to exist in computer aptitude across both groups. Therefore, the failure to reject the null hypothesis indicated that, with respect to computer aptitude, no significant differences appeared to exist between subjects classified as learning disabled and those subjects classified as non-learning-disabled. Although Chi-Square estimates indicate the reliability of between-group differences, they do not indicate the degree of association between the variables contrasted (Cohen and Cohen, 1975). Thus, phi coefficients, an association measure in the 2 X 2 case, were also calculated. The reported $Ø^2$ of .021 between learning disabled and non-learning disabled subjects and their respective CAQ scores indicated that the relationship between computer aptitude and subject learning classification was marginal, at best.

Table 1. Learning disabled (LD) and Non-learning disabled (NLD) by Computer Aptitude Quotient (CAQ).

CAQ	NLD	LD	Total
High	27(25)	23(25)	50
Low	29(31)	33(31)	62
	56	56	112

$X^2 = 2.32^*$; df = 1; $\emptyset^2 = .021$

* X^2 (N. S.)

Note: Expected Values in parentheses.

The second area of interest in this study was the intra-group sex differences in CAQ scores for non-learning disabled subjects. The null hypothesis tested was:

Ho_2: There is no relationship between sex and computer aptitude for non-learning disabled subjects.

Table 2 illustrates the finding that no significant difference existed in computer aptitude scores between male and female non-learning disabled subjects ($X^2 = .06$; df - 1). Thus, the null hypothesis was not rejected. The low $\emptyset^2$ of .001 indicated almost no relationship between the dependent variable (CAQ) and the independent measure, sex. This supports the notion that computer aptitude is not a sex-dependent trait. Furthermore, non-learning disabled males and

females, according to the CALIP index, possess the same potential for achievement in computer-related activities.

Table 2. Non-learning disabled (NLD) by Sex and CAQ.

CAQ	M	F	Total
High	12(13.5)	15(13.5)	27
Low	16(14.5)	13(15.5)	29
	28	28	56

$X^2 = .06$*; df = 1; $\emptyset^2 = .001$

* X^2 (N. S.)

Note: Expected Values in parenthesis.

The final area of interest, the intra-group sex differences in CAQ scores for those subjects classified as learning disabled, was tested by the following hypothesis:

Ho_3: There is no relationship between sex and computer aptitude for learning disabled subjects.

Table 3 shows that a significant difference in computer aptitude between male and female subjects, classified as learning disabled, was found ($X^2 = 5.84$; df = 1; $p < .05$). Furthermore, the reported $\emptyset^2$ of .10 revealed a slight relationship between sex and CAQ score. In this case, the rejection of the null hypothesis implies that some aspect of learning disabilities creates a disparity in computer between male and female junior high school students. By contrast,

propositions about differences in reasoning ability or mental processes among the learning disabled. The same or similar skills required for success at computer-related activities were present in both groups.

The study does, however, support notions about the merits of computer intervention with the learning disabled. There is reason to believe that such activities engage reasoning at the same levels for both learning disabled and non-learning disabled students, suggesting that the groups begin to approximate each other in thought.

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non-learning disabled students versus learning disabled appear to be statistically homogeneous in computer aptitude, irrespective of sex.

Table 3. Learning disabled (LD) by Sex and CAQ.

CAQ	M	F	Total
High	16(11.5)	7(11.5)	23
Low	12(17.5)	21(17.5)	33
	28	28	56

$X2 = 5.84^{*}$; df = 1; 02 = .10

* p < .05.

Note: Expected Values in parenthesis.

Discussion

The results of this study support former research (Hearne & Lasley, 1985; Poplin et al., 1984) indicating that computer aptitude is not gender-specific. Where marginal differences existed between male and female learning disabled students, a general emphasis upon reading and language in resource programs had possibly contributed to a delay in mathematical (conceptual) development among females. Likewise, the general level of interest in computers among males was higher than that expressed by females, as was experience.

Because there was no significant difference between CAQ scores for the two groups in this sample, there is no evidence to support

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